Automated Gardening System Usage Instructions

How to Run the System

UI mode

Purpose: This mode provides a graphical user interface to interact with the virtual garden.

Usage:

1. Open "Automated-gardening-system" as a project in Intellij IDE.
2. Find the entry file "GardenApplication.java" in location "Automated-gardening-system\src\main\java\application".
3. Execute "GardenApplication.java" to start the simulation where you can manually trigger events, monitor the garden's status, and adjust settings through a graphical interface.

API mode

Purpose: A testing tool used via the API to test the resilience and robustness of the code under various simulated conditions.

Usage:

- The API class "`api.GardenSimulationAPI`" including the following public methods as requested in the assignment:
  - `void initializeGarden()`
  - `Map<String, Object> getPlants()`
  - `void rain(int)`
  - `void temperature(int)`
  - `void parasite(String)`
  - `void getState()`
- We also provide an API to end the simulation (this method can be called after simulate "24 days"):
  - `void stopSimulation()`
- In folder "Automated-gardening-system\src\main\java\api", there is an entry file "GardenSimulator.java". We wrote this simulated entry file based on the document "Gardening System APIs" provided in the assignment to test how the system behaves under automated, scripted conditions.
- **To test our system, replace or update the "GardenSimulator.java" with your own simulated entry file / code, and run it.**
  - Don't forget to set a correct package name (`api`) for your `GardenSimulator`.

System Overview

The Automated Gardening System is designed to dynamically simulate an interactive garden environment. It incorporates real-time changes and interactions based on several subsystems and user inputs.

Daily Tasks

1. Weather and Temperature

At the start of each day, the system randomly alters weather conditions and temperature to simulate real environmental changes.

2. Pest Attacks

Random pest attacks are simulated, requiring the system's immediate response to protect the plant health.

3. Humidity Adjustment

The system automatically decreases the humidity level of all plants by 5 daily to mimic natural drying.

Key Components

Watering System

Components: Includes water sensors and water controllers.
Functionality: The sensors monitor the plant's humidity levels, triggering the water controller to activate sprinklers if the plants are dry or apply protective measures if plants are overwatered.

Temperature System

Components: Includes a temperature sensor and a temperature controller.
Functionality: Operates similarly to the watering system, where the cooler or heater adjusts the garden's temperature to optimal levels for plant growth.

Pest Control System

Components: Includes pest sensors and pest controllers.
Functionality: Detects pest activities and decides whether to release beneficial insects like ladybugs or apply pesticides.

User Overrides

Description: Users have the capability to override automatic systems via the API, setting specific environmental conditions or triggering specific actions. These user-defined events coexist with daily automated events, ensuring that routine environmental adjustments occur regardless of user interventions.

Plant Types and Environmental Requirements

Trees: Peach, Cherry

Water Level: Minimum 20, Maximum 100
Water Level Thresholds: Minimum 30, Maximum 90
Pests: Aphid, Spider

Flowers: Hydrangea, Rose

Water Level: Minimum 10, Maximum 50
Water Level Thresholds: Minimum 20, Maximum 40
Pests: Aphid, Spider

Crops: Cherry Tomato, Chili Pepper

Water Level: Minimum 30, Maximum 80
Water Level Thresholds: Minimum 40, Maximum 70
Pests: Aphid, Spider, Whitefly

Temperature Range: 32°F to 122°F
Temperature Thresholds: Minimum 50°F, Maximum 104°F
Optimal Temperature: 77°F

User Interface Usage Instructions

Layout

Our Garden layout includes 15 plots, each capable of hosting a certain type of plant group

Control buttons

At the bottom of the interface, we have several control buttons.

Plant button: Allows users to add new plants to the garden.

Water button: Allows users to water a group of plants. Watering an empty plot is now allowed.

Rain button: Only appears when the current weather is sunny, allows users to trigger a rain event with a random amount of rain

Sun button: Only appears when the current weather is rainy, allows users to stop a rain event.

Pest button: Provides three types of pests for users to choose. Allows users to trigger a pest attack event.

NextDay button: Speedup the simulation. Help users jump to the next day.

Current plot status

By clicking on each plot, we have a status panel that displays the current plot conditions.